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Tuberculin.

From the veterinary column of last week's *Field* we have reprinted the greater part of an article calculated to seriously mislead stock-owners by directing them not to the value of this new diagnostic agent but to some hyper-critical objections. The first little bogey the writer exhibits is the possibility of the agent being so carelessly prepared as to contain the living bacilli of disease or of its being inert. Possibility of error appertains to everything human. No drug that we use is free from the possibility of danger due to some person's carelessness. No food that we eat or water that we drink is always safe. If we are to decline to move or to act until certainty of error is eliminated we shall simply stand shivering in doubt till dooms-day. There are men who mistake this mental attitude for scientific caution, men who are always in doubt themselves and who seem to desire companionship in their affliction. Such men are a drag on the coach of progress, and as all progress is uphill a drag is, in such connection, not only unnecessary but a nuisance.

In support of his doubts as to the safety of tuberculin, the writer states that the sale of the agent is not protected by law, and that anyone may make or sell it. This is true, but who would buy this unguaranteed and perhaps unreliable article? The stock-owner is not more likely to institute amateur experiments with tuberculin than with arsenic, and the veterinary surgeon may safely be permitted to judge of the value of the agents he uses. We believe we are correct in stating that all the tuberculin sold in this country comes either from the Koch or Pasteur institutes excepting what is made here at the Royal Veterinary College or at the British Institute of Preventive Medicine. The wholesale druggists do not make their own, and are possessed of sufficient reputation to afford most of their customers no anxiety as to the purity or activity of this and other preparations.

The second point of the article discusses the "circumstances under which its use is necessary or expedient." The writer insists that it should not be used unless there be some ground for suspecting the existence of disease. This may be granted. Few stock-owners would trouble to look for a disease the existence of which was not anticipated. The writer next says "The proposition to use tuberculin in the ordinary course of the cattle trade is to be deprecated." We are not sure that we quite understand what is meant. No one has yet imagined the cattle dealer carefully testing the condition of all his purchases. There are, however, sections of "the cattle trade" in which the use of tuberculin is advisable. It should be used by keepers of dairy stock on every new purchase, so that they may be able to clear their stock of disease and guard against its reintroduction. It should be used by all purchasers of pedigree stock for very obvious reasons. At present the owners of pedigree cattle are the persons who have most to lose by enquiries into tuberculosis. These gentlemen are usually possessed of political influence and may be relied upon to oppose all legislation until some means is found to stop the sale of their infected herds.

The next point urged is that "all the animals which react to the test should certainly be prepared for slaughter." We fancy the writer of the article must be a veterinarian and one opposed to legislation against tuberculosis. No more telling obstacle to legislation can be invented than the loss and expense of radical stamping out. If we desired to support the do-nothing policy we should always insist that every animal reacting to the test should be slaughtered. This is only another bogey. Reaction points to no necessity for immediate slaughter, but it affords an indication for separation and isolation—an indication given only by the use of tuberculin in a stage when prevention of spread of disease and salvage of stock can be profitably attained. The writer of *The Field* article is apparently unacquainted with the work of Prof. Bang, who has shown in Denmark how, by the aid of tuberculin, cattle may be protected from infection, how even healthy animals may be bred from an infected herd—how, in fact, tuberculosis may be practically tackled.

The article concludes with a reference to the case of 95 cows which were tested by tuberculin with the result that 71 reacted, and most of the suspects were sold. The comment on this is "We venture to doubt the legality of the procedure. An action for damages might show that the transaction was decidedly illegal." On the supposition that the writer is opposed to any legislation we quite understand his disapproval of the procedure and his attempt to prevent its repetition by suggesting an action for damages. This of course is only another bogey. There is no law against selling tuberculous animals, You have only to avoid selling them as sound. We are particularly pleased with the case and quite approve the sale of the dangerous diseased cows. A few more similar procedures will soon compel all purchasers of cattle to use tuberculin, and force the legislature to take some steps to stamp out the disease. Tuberculin and Mallein are strong forces for evil when not used for the good of a community.

Small-Bore Bullets.

Some years ago Veterinary-Captain Fred Smith showed by positive experiment ths effect of small-bore bullets moving at high velocities. He showed that they made a very small external wound, that they did little harm to soft tissues excepting hollow organs of special importance, but that they had a terrible effect upon bones. Then a military surgeon

wrote that this was all wrong, and that the small bullet drilled little holes through bones and formed harmless aseptic tracks through soft tissues. After this we had some experiments by military surgeons in Europe, and at home two men shot in a riot. Results agreed with the experiments of Captain Smith.

The question is again being discussed on some observations made by a surgeon with the troops who went to Chitral. This surgeon saw some natives who had been struck by our bullets. Some of the natives had apparently been wounded by more than one bullet and yet seemed little the worse. On the strength of these observations men are seriously discussing whether the small-bore would stop a rush of determined fanatics or whether a wild animal could be stopped when charging. The Chitral natives who were only wounded through soft tissues were not much the worse. Those whose bones or vital organs were hit did not present themselves—probably because they were already buried. Perhaps some of our A.V.D. readers may have some experience of the wounds resulting from the small-bore bullet. It would be interesting and instructive.

Compulsory Notification.

There are two arguments against the application of this law to veterinary surgeons which will not stand much examination.

One is, that a fee of half-a-crown is insufficient. This overlooks the fact that notification entails no trouble or expense. It is only when a case of contagious disease comes under notice that action would be required. Each half-crown would be earned by filling up and posting a form.

The other argument is that notification would lead to unpleasantness with clients. At present we voluntarily advise clients to notify and ninety-nine out of a hundred accept our advice. The odd one who does not is as a rule not the most respectable and we may safely ignore him. If notification were compulsory on us the shifty client would not invite our attention unless he had decided to abide by the law.

The objections so far stated have not much weight and are certainly not sufficient to overweigh the good likely to accrue to the public, or to deter practitioners from earning an extra fee.

Docking.

We reported a case recently in which some men were fined £5 each for docking a horse. As usual in prosecutions for cruelty the defendants were poor and ignorant men. It was useless for their solicitors to plead that nearly every horse in the streets of London is docked and that public usage permitted the operation. It is not heroic of the Society for the Prevention of Cruelty to Animals to only pick odd cases of docking for prosecution, but it is astute business. Slowly and gradually they are obtaining convictions all over the country, and magistrates are being educated to accept the act as cruelty. So far of course the Society always speak of the operation as being improperly performed and their veterinary surgeons are reported as making some remarkable statements in their evidence. In this case to which we specially refer one professional gentleman said the use of the hot iron was not now adopted by veterinary surgeons. Another said it had not been taught for fifty years. The fact is that probably not one surgery out of a hundred does not include in its stock of instruments a docking knife and iron. Now let us be fair and honest. If docking is a justifiable operation let us say so and let us allow that there are hundreds of dealers who can perform the operation as deftly as any practitioner. If the R.S.P.C.A. are permitted to go on as they are doing without taking a proper test case we shall soon arrive at the question whether is docking cruel when done by a dealer but not cruel when done by a M.R.C.V.S? The answer of one of Her Majesty's Judges may be easily anticipated.

CASES AND ARTICLES.

COMPULSORY NOTIFICATION.

By A. Prudames.

Although it may be repeating views already expressed relative to the compulsory notification of infectious diseases of animals by veterinary surgeons I desire to offer the opinion of a country practitioner. Many of us allow matters of importance to drift on to our disadvantage without even a protest—due in many cases to our having to work long hours in order to exist. Thanks to quack medicines, as well as professorial and other pamphlets, it is already a sufficiently uphill game without a further obstacle being voluntarily placed in the way.

Up to the present time veterinary surgeons have acted loyally by advising their clients to give legal notice when requisite. After this should our clients prefer to run the risk (which is rarely done) let them pay the penalty, instead of shifting the responsibility on to our shoulders. Some owners are already very chary of sending for us, except as a last resource, when all other so called available means have failed, this reluctance would be doubled should the proposed act come into operation, indeed we should be looked upon as informers, particularly if, as it is suggested, we have the noble fee of 2s. 6d. for each report!!

There are many doubtful cases, only determinable by a post-mortem examination which we should not have the power to enforce, although still liable to a penalty if proved to be a case of infectious disease. There is a future in which other diseases will, or should be, scheduled in the list, such for instance as tuberculosis, many of these cases are only to be demonstrated by the injection of tuberculin, which would under these conditions be objected to. It is very natural for young members who have not felt the pinch of these difficulties, and possibly may never do so, to express their views of advancing the profession as they think, in fluent words and grand ideas; but older men are generally more retiring, and fear that cutting sarcasm which is too often indulged in.

COMPULSORY NOTIFICATION.

In your editorial article of July 27th with regard to compulsory notification you suggest that we may just as well make a virtue of necessity, and instead of opposing what we cannot prevent, offer our willing assistance. Moreover you go on to say that probably this line may lead to some readjustment of our position in relation to the Board of Agriculture to the Local Authorities if we point out how ungraciously we are rewarded for all our help.

Now it seems to me that so far everybody has been finding fault with the Board of Agriculture and the Local Authorities, certainly with good reason, without offering any tangible solution of the difficulty. I think that if we were as a body to suggest a new

system to some extent which would be both to our own benefit and to that of the public we should stand a much better chance of getting our wrongs redressed.

I beg to make a few suggestions chiefly in order to start a discussion and gain other opinions.

My idea is that veterinary officers of health with fixed salaries should be appointed by the Government to certain districts so that they should have the power to deal with Contagious Diseases (Animals) under the Board of Agriculture and Local Authority.

Compulsory notification is of course necessary and these officers should be notified by practitioners of the existence of these diseases, and then with the help of the Local Authority, the police measures could be taken for stamping out the disease. The Veterinary Officer of Health being a public servant naturally should not be allowed to do any private practice. The existing practice of having inspectors outside the profession at large salaries, and making butchers of veterinary surgeons is of course unspeakably unjust if not dangerous.

Public slaughter-houses and meat inspection (compulsory) are bound to come in time, and the Veterinary Officer of Health should inspect these as part of his duty, and if necessary he and the Medical Officer of Health for the district might confer together for the public good.

I am aware that some country practitioners will say that this system would rob them of some of their income at present obtained as Government *Inspectors!!* There is, however, another side to the question.

Everyone is aware that competition is getting very severe now in some places as the members of the profession increase, but with this system in vogue employment would be found for a great many existing practitioners and so relieve the congestion in some districts. I offer the above remedy as a suggestion with the hope that it will draw criticisms from members of the profession more entitled from age and experience to write upon these matters than myself.

G. K. W.

EXTRACTS AND NOTES.

HORSE-SICKNESS.

Dr. Edington, in his report for 1894 (which was laid on the table of the House of Assembly on July 14th) as Director of the Bacteriological Institute, deals exhaustively with the subject of horse sickness. Having mentioned the periods since 1780 in which the disease was epidemic, and pointed out that in the low country of the Transvaal and the neighbourhood of Delagoa Bay it is constantly present every year, he states that the disease attacks horses, asses, and mules, and in some cases zebras and quaggas. It has been stated that the disease in the Transvaal is different from that in the Colony, and while he is not prepared to accept this statement as absolutely trustworthy, Dr. Edington feels that it requires investigation, and he proposes to institute full inquiries at as early a date as possible.

The season in which horse sickness most abounds is summer. In Cape Colony an epidemic is usually preceded by a succession of hot days, during which a considerable moisture is present in the atmosphere, and in the evenings there are heavy dews. The inquiry made by the Government in 1854-5, at the instance of the Cape of Good Hope Agricultural Society, is dealt with, and the conclusions arrived at mentioned. The investigations made in Natal by Mr. Nunn in 1887, and their results are also given. Up to 1891 a considerable amount of valuable negative evidence has been brought forward, but no knowledge of a positive character which could tend to elucidate the cause of the disease, its prevention, or cure. Dr. Edington commenced its investigation in June, 1891.

Symptoms.

There are two varieties of horse sickness (says Dr. Edington), "paardziekte" and the "dikkop." In the former no very definite symptoms are observable until shortly before death. The incubation period of the disease—*i.e.*, that period limited by the actual moment of infection and the onset of certain symptoms—varies between seven and nine days. The first symptom is the onset of a rigor, so that if the temperature be taken per rectum it will be found, on the evening of the seventh or eighth day, to have gone up to 102 deg. or 103 deg. Fahrenheit. On the following morning it descends to almost normal, but increases again in the evening to a point a little higher than that of the preceding evening; this continuing until a few hours before death, when it is common to notice a sudden descent. The horse does not usually go off his food until close upon the moment of death. Contrarily, it frequently exhibits a most voracious appetite. The heart's action remains almost unimpaired, until the onset of the marked symptoms. Farmers as a rule overlook these symptoms, and hence their observations are limited to the time when the animal becomes moribund. These latter symptoms are ushered in by weariness. In the "dikkop" form the incubation period is almost, if not absolutely, identical; but while in "paardziekte" the fatal issue commonly occurs in twelve days, in "dikkop" it may be delayed for a few days later. The commonly observed symptoms usually occur about the tenth day, and consist in swelling of the subcutaneous tissue of the head. In some cases this swelling is mostly confined to the tongue, constituting the variety known as blue tongue. Weariness is a common feature, and the animal seeks to support its head on the side of the stall or on the manger.

Post-Mortem Examinations.

Dr. Edington states that he has up to this date made a series of post-mortem examinations of horses dying either from spontaneous or inoculated horse sickness in the Colony and Natal to the number of seventy animals, including those made on mules. He details a number of more or less typical cases in the report, and then gives a summary of the post-mortem examinations, describing the appearance of the lungs, heart, liver, and kidneys. On the whole, he concludes the one chief feature of horse sickness is the remarkable exudation into subcutaneous and subserous, remarkable in kind and amount, and which goes to distinguish it from all other known diseases.

Inoculation Experiments.

The temperatures of all animals under experiment are taken every three hours. It is found that in a condition apparently of health, different horses may show curves of temperature varying the one from the other. It has been shown that it is possible to confer upon an animal the disease in such wise that the symptoms produced will be almost absolutely identical with either of the ordinary forms acquired spontaneously. Certain post mortem

phenomena occur in all forms. With regard to the exact manner in which the contagium of horse sickness is conveyed naturally. Dr. Edington was anxious to learn whether it was due to inhalation of the spores into the air passages, by their ingestion with the food swallowed or by both. He tried to infect veld by allowing the fluid from horse sickness to deposit itself directly from infected animals to plots of grass, meaning to cause healthy animals to breathe through the air bags in which this grass could be placed, but so far he has not succeeded. Numerous experiments were made to determine whether the injection of horse-sickness virus could infect healthy horses. As a result of careful and minute examination, he advises that when an animal is spontaneously affected it should not be allowed to roam over the veld and deposit in numerous places the yellow fluid as it drops from it mouth and nose. This fluid ought to be buried whenever seen, as a preventive measure against the infection of veld. Having described a number of further experiments with guinea-pigs, mice, and calves, Dr. Edington proceeds to consider the results obtained from giving certain drugs to animals affected, in the hope of either alleviating or curing them. He has tried a great variety of drugs, but the practical conclusion is that if the disease has really developed, drugs are practically useless.

NATURE OF THE ORGANISM.

The nature or organism of horse-sickness is discussed at considerable length. As the result of careful examination an organism was found, which is illustrated by elaborate plates. He was unable, however, in spite of systematic experiments, to cultivate the organism in a manner or with such result as he could wish. After discussing the microbe at length, Dr. Edington says he had hoped to be able to bring forward some experiments dealing with preventive inoculation, but these are not far enough advanced for the purpose of report.

In conclusion, he says that the experiments made in this disease, apart from the great interest which attaches to them, are of universal value as showing us a new line of march of infective disease, and furnishing to us a key which may be successful, not only in elucidating the problem of South African horse-sickness, but also possibly of other of the stock diseases which seem to be almost peculiar to our country.—*Cape Times.*

MEAT INSPECTION AND SLAUGHTERING.

Dr. T. M. Legge, in opening the discussion on the Regulation of the Slaughter of Animals for Human Food and the Inspection of Animals before and during slaughter, said that in his opinion a person who had qualified both in medicine and veterinary science would have been the one most suited to have done so. His only claim to undertake the task was that he had devoted some attention, in the principal capitals of Northern Europe, to the methods adopted for the inspection of meat. Great Britain was in the matter of meat inspection twenty years at least behind Germany, France, Belgium, and Denmark. The explanation was to be found in the fact that veterinary science was at a higher level abroad than in this country, partly because the veterinary colleges there were State supported, and partly because more opportunity was given to veterinary surgeons in the practice of their profession by the numerous appointments given to them as experts on meat. Then, again, public abattoirs having existed for a considerable period of time abroad the need of a scientific control of the animals slaughtered in them had been more felt. The first point he would lay stress on was the necessity for compulsory powers to close private slaughter-houses and to the erection in their stead, in all towns of more than 5000 inhabitants, of public abattoirs. An occupation such as the slaughtering of animals, that was in many of its details revolting, and which might lead if proper care were not taken to grave nuisance, ought to be concentrated as much as possible. The advantages to be gained from centralising this and all the various processes incidental to it—such as gut scraping, fat melting, the extraction of the albumen from blood, etc.—far outweighed in his mind the objections urged on the other side by the butchers. The credit of having introduced public slaughter-houses in France must be attributed to Napoleon I. In Prussia the law of 1868, supplemented by that of 1881, gave the powers to local authorities to compel the butchers to close their private slaughter-houses and slaughter only in the public abattoirs, and making it at the same time a punishable offence to introduce into the city from outside fresh meat without first submitting it to an expert for examination.

After describing very briefly the abattoirs abroad with which he was most familiar (as Paris, Brussels, Berlin, and Copenhagen) Dr. Legge proceeded to the second main point—namely, the necessity for appointing professional meat inspectors, preferably from the ranks of veterinary surgeons, to replace the untrained persons at present charged with the work. He would prefer to leave to the veterinary inspector-in-chief the final decision as to what meat should be condemned or not, rather than to the medical officer of health and a justice. Abroad, as soon as the principle of meat inspection was recognised there never was the least doubt that the persons best qualified to undertake the work were veterinary surgeons, and, speaking generally, in all large towns in France, Germany, and Belgium such persons were the only experts legally recognised on the subject. Reference was made to the sub-inspectors in Belgium and to the examinations they were obliged to pass. An outline was given of the routine method of inspection adopted at the abattoirs abroad and at the stations where the carcases of animals slaughtered outside the town were examined. He then called attention to the unsatisfactory state of the law in Great Britain under which the condemnation of diseased meat was made, and dwelt on the law dealing with the subject in Germany and France. In Germany the Imperial law of 1879 on "the Trade in Food Stuffs" recognised only two kinds of bad meat—(1) that which was injurious to health (*gesundheitsschadlich*); and (2) bad or spurious (*verdorben*). The local regulations, however, that were adopted in such towns as had suppressed private slaughter-houses went much further and chiefly determined the action of the veterinary inspector. Under them the second division of bad (*verdorben*) meat became further divided into—(*a*) meat that was bad in the ordinary sense of the word, and to be treated therefore as equivalent to injurious to health; and (*b*) meat that was bad, but not so bad that it might not be utilised as food, provided its condition was marked as being either "of diminished value" (*minderwertig*) or "defective in quality" (*mangelhaft*). The regulations with regard to tuberculous meat had been considerably modified in Germany by a Ministerial decree issued in 1892, which allowed greater latitude in the consumption of such food. The most important points in it were: 1. The meat of tuberculous cattle must, as a rule, be regarded as dangerous to health (and therefore be condemned) when the muscular tissue contains tubercles or when the animal is wasted, even though no tubercles are found in the muscles. 2. The flesh of tuberculous animals must not be regarded as injurious to health when the tubercles are found—(*a*) exclusively in one organ, or (*b*) when two or more organs being affected, they lie in the same cavity, and are not connected with one another by lymph channels or by bloodvessels belonging to the systemic circulation. Such meat is to

be regarded as of first quality and to be sold without any restrictions. The importance of the regulation is seen when it is recognised that section 2 includes about 65 per cent. of all tuberculous animals. Stress was laid on the way in which tuberculous meat was rendered absolutely sterile by steam cooking in the Rohsbeck steam ovens at Berlin. The absence of reference in the reports of medical officers of health to the diseases on account of which meat was seized was mentioned, and attention drawn to the admirable statistics on this subject in the report of the Berlin abattoir. In conclusion, he referred to the report of the Royal Commission appointed to inquire into the effect of food derived from tuberculous animals. It was a matter for great regret, he thought that the terms of that inquiry did not permit of any report being made as to the administrative procedure available for reducing the amount of tuberculous material in the food supplied by animals to man. Seeing what was being done in Denmark, chiefly through Professor Bang's efforts, in employing tuberculin as a means of diagnosing tuberculosis in cattle, he believed that the matter could not be left where it was, and he hoped that another Royal Commission would be appointed to inquire not only into the preventive measures to be taken against tuberculosis, and the terms of which would be such as to include the whole question of meat inspection.

Dr. H. R. Sydney Marsden, speaking on the same subject, said that the consideration of the subject naturally divided itself under three heads, namely—(1) treatment of cattle before slaughter, lairage accommodation, &c.; (2) method of slaughter and dressing of animals; and (3) treatment and inspection of the carcase after dressing. Animals should be brought to the slaughter-house as quietly as possible. Proper lairage accommodation should be provided, in the form of enclosed sheds, with good top light and ventilation (side ventilation was too cold in the winter months). The surface of the floor should be flagged and channeled, with a good fall from the head to the rear, so as to keep the standing always dry, and all drains should be outside the building. There should be a plentiful supply of water. The animals should be poleaxed and pithed without delay, stuck immediately after pithing, and the body well bled. All carcases and offal should hang in a properly ventilated, light, clean, and cool cooling house for twelve hours after slaughter. Most diseases showed themselves at once, and it was important that the meat inspector should see the diseased parts before anything had been done to them to alter their appearance. But there were cases in which the disease was more noticeable after the carcase and offal had cooled; it was therefore important that they should be inspected both before and after cooling. The following diseases showed themselves at once: tubercle, pleuro-pneumonia, peritonitis, anthrax, cystic disease of the kidney, abscesses, Texan fever, swine fever, and puerperal fever; but the disease showed itself more distinctly after cooling as regards colour, smell (or both), &c., in the following cases: Texan, swine, and puerperal fevers, jaundice, most diseases of the kidney, and inflammations generally. A word should be said about the freezing of carcases. No carcase should be put into the refrigerator until properly cooled, the freezing process should then be gradual and not too great, otherwise the carcase sweated again on exposure.

Dr. John F. J. Sykes (medical officer of health for St. Pancras) said that diseased meat must be prevented from being distributed for food. This applied equally to home killed dead meat and to imported dead meat. The best time to judge of the health of food animals was at the time of slaughtering, when they could be examined during life as well as after death, but above all when the internal organs could be examined together with the carcase and at the same time. In order to facilitate the inspection of home killed meat the aggregation of slaughter-houses was desirable. In spite of precautions it would be possible to foist upon the market meat of animals dying of disease. In order to prevent this and to take away the inducement to profit by the sale of diseased meat it would be necessary to institute—(1) the systematic inspection of milch cows at periodical intervals by veterinary inspectors; (2) the purchase at public expense of diseased animals and meat before exposure for sale at a price that would materially relieve the owner from bearing the whole loss—in other words, paying compensation; or (3) failing the adoption of this course the compulsory examination and marking of all meat and the prohibition to sell meat without the recognised token or mark.

Surgeon-Major Poole, M.D., (Norwood) supported Dr. Legge's paper. He entirely objected to private slaughter-houses.

Dr. Hill (Birmingham) advocated the abolition of private slaughter-houses, which were centres of filth and disease, contaminated the sewers, and also enabled the dishonest butcher to hide away carcases which ought not to go into the market.

After some discussion, on the motion of Dr. Newsholme (Brighton), the following resolution was passed: "That, in the opinion of this Section, and in view of the fact that the Royal Commission on the Effect of Tuberculous Food on Human Health by the terms of their appointment were restricted to tuberculosis, it is desirable that a Royal Commission be appointed to consider the whole question of meat supply and inspection. That a copy of this resolution be sent to all the Ministers of State."—*The Lancet.*

THE REPARATIVE PROCESS IN DISEASE.

Dr. Wilks in his address as President of the Pathology Section, said:—

Now just as the body grows and decays as a whole during a term of years, so we may see the two processes of production and destruction going on in its several parts when subjected to any special stimulus, such as an injury or other morbid influence. It is to this subject I wish to draw your attention, for although my own mind has often been directed to it, I think in all that I have written and taught I have failed to lay sufficient weight on the distinction between them. When speaking of any unnatural condition of any adventitious substance found in the body, I have, like many others, employed the term "morbid," and been content with the expression, whereas a little further consideration would have shown that only a portion of what is found would rightly answer to the term, a part only being strictly pathological, while the other is a result of a true physiological process; in fact, the simple words disease or morbid imply too much of destruction without a recognition of a corresponding reparation. With regard to injuries, the reparative and conservative conditions are generally clear, witnessed in scars, or where a spine of bone is made to support the fractured shaft of a limb which is united at an angle. In many forms of internal disease, also, we all recognise the reparative process, and have no difficulty in distinguishing the physiological from the truly pathological; for example, in valvular disease of the heart where we at once perceive how the hypertrophied cavities, are the manifestation of physiological and conservative processes, and in the same manner hypertrophy of the muscular fibre of the uterus, of the intestine, or of the bladder, indicate obstruction in the passages of these organs. There are, however,

more complex states where the pathological and physiological changes have gone on side by side and thus make it more difficult to assign to each their due proportion. In an ordinary ulcer the two processes are seen going on before the eye, for although the old definition implied a simple destructive process merely, yet we can clearly perceive during the process of granulation and in the secretion that new material is being formed. Mr. Golding Bird has well said that in an ulcer we see a constructive inflammation, and that there is not merely a loss of tissue, but there is embryonic life going on again—a recommencement of evolution, a redevelopment of growth from elementary cells, the embryonic elements being always present and roused to action by the inflammatory process, so that the two conditions of growth and decay are mutually dependent. In the human being the same processes are perpetually going on, not only in health, but in states so-called diseased, as in the above mentioned example of ulcer. Yet this double process is continually overlooked, no doubt from the difficulty we have in being able to separate the reparative from the true morbid action. In most instances this is owing to the fact of the reparative material not being equal in organisation and similar in structure to the original tissue. The complex parenchymatous structures are not renewed after injury, like the simpler one of bone or areolar tissue, although occasionally we meet with a true growth of nerve fibre or adenoid structure. What we generally mean, therefore, by repair is not reparation by a growth resembling the original structure, but by a growth of lower organisable material. Still the attempt at repair, in whatever way it may be accomplished, is continually visible, and the object of these remarks is to point out not only where we have been remiss in failing sufficiently to recognise the true interpretation to be put upon many of the new changes we meet with in the tissues, but have been content to style them all in a very cursory manner morbid. This distinction has an important clinical side as regards prognosis and treatment, besides being one of pathological interest.

I will endeavour to illustrate my meaning by one or two examples, and will take first the case of phthisis. During a long experience in practice I have seen nothing so common as an error in the prognosis of this disease. And why? Because the constructive changes have been confounded with the destructive ones; in fact, the very signs which the beginner regards as the strongest proofs of disease are those which indicate the probability of cure. He learns the signs of a cavity in the lung, and then recognising its existence in a particular case, he immediately condemns his patient, feeling instinctively that nothing could be more terrible than the existence of a large hole in a vital organ. And yet a moment's consideration would show him that the dull tympanitic note, the absence of vibration in the chest walls, their sinking in, the pectoriloquy, &c., all point to a hard-walled cavity due to a reconstructive action following the destructive process. The formation of this fibrous tissue has shut off the part destroyed from that of the healthy lung, a reparation and cure have been going on and produced those marked physical signs which he has regarded as indicative of disease. No wonder, therefore, that a mistake in prognosis has been made, and that after condemning a patient who has manifested such physical signs the medical man has been surprised to find him still living years afterwards. I have, indeed, not only seen the mistake made by young and inexperienced men, but by older members of the profession; but have often confessed their surprise on seeing phthisical patients still alive whom they had condemned years before. This case of phthisis is perhaps the commonest example, where the constructive and destructive processes have not been sufficiently distinguished; but we will now take another case, where the changes are more complex, and where a greater difficulty exists in distinguishing those which may be regarded as destructive and those which are reparative. I refer to cirrhosis of the liver. This organ may be observed during life to be first enlarged and then become nodulated and shrunken; amongst other signs of the disease which the text books describe is an enlargement of the veins on the surface of the abdomen. These were thought at one time to be due to some pressure on the vena cava, but this is really not the case, and the appearance is now shown to be due to an enlargement of the epigastric vein in connection with the opening up of the old umbilical vein, which often becomes as large as a goose quill. Through this the portal blood flows and finds a free passage into the vena cava and systemic circulation. Injections may be easily made to pass from one system into the other. The patient in this way is relieved from an engorgement of the portal system and from the consequent dropsy. This enlargement of the veins, therefore, which is simply described as a sign of cirrhosis, should also be spoken of as a sign of a reparative character. And probably this is not all, for when the cirrhotic organ is examined carefully and microscopically we find that, although the nodules are composed mainly of atrophied hepatic tissue, there has also been an attempt to replace it by a new formation of cells and vessels. New bloodvessels may be seen and apparently new ducts, as well as cell growth. Now, although these new elements are not perfect enough to take on the function of the liver, there can be little doubt that they do relieve the circulation in a disabled organ. That new hepatic structure may grow under the strain of necessity is seen in those cases where portions of the liver have been destroyed by injury or disease in the same way that one kidney will double its size when its fellow from any cause has become atrophied.—*The Lancet.*

TUBERCULIN AND TUBERCLE.

Stockowners are constantly reminded that tuberculin has a special value in the diagnosis of tubercle; and notwithstanding a certain proportion of recorded failures, there is no good reason for questioning the soundness of the general conclusion. There are, however, certain points in connection with the use of tuberculin in what may fairly be called an indiscriminate manner, which seem to demand more consideration than has yet been accorded to them. The points in question are: (*a*) The proper mode of preparing the agent; (*b*) the circumstances under which its use is necessary or expedient; (*c*) the possible results of the injection of the agent into the system of a diseased or healthy animal.

No argument is required to prove what is self evident, *i.e.*, that unless tuberculin is properly prepared it may contain an active virus, on account of some of the living bacilli or their spores remaining in the fluid, or, on the other hand it may be quite inert, from the absence of the chemical substances on which its activity depends. To be perfect in action tuberculin must not only be free from active living germs, but must instead contain the necessary chemical constituents.

No laws exists—perhaps it may be assumed that none is likely to be passed—to restrict the making or selling of tuberculin to licensed persons. At present anyone may manufacture the agent in any manner which he may consider best, and may sell it to as many persons as he can induce to purchase it.

Up to the present time there has not been any very large demand for tuberculin, but it is becoming an article of commerce, and in the advertisements which are issued the reader is informed where the agent is sold, no hint being given, so far as we have seen, of the source

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whence it has been obtained, nor any guarantee of its genuineness offered.

Considering the amount of mischief which may be done by the use of a preparation which contains active virus, or is quite inert, the stockowner should certainly take care to insist on evidence being given that the test which he proposes to apply shall be as conclusive as it can be made, and to this end he should, as a matter of course, intrust the details to an experienced veterinarian, who would be in a position to obtain the agent from a recognised authority, and employ it with all necessary precautions.

In regard to the circumstances under which the injection of tuberculin for the diagnosis of tubercle is desirable, it may reasonably be urged that there should be some ground for suspecting the existence of the disease in the herd before the test is applied. The proposition to use tuberculin in the ordinary course of the cattle trade is to be deprecated. To say that the agent does not contain any infective matter is to beg the whole question. The assertion is only true if certain conditions have been strictly observed, and even then the fluid does contain certain poisonous substances which are the product of the cultivation of the tubercle bacillus. It cannot, therefore, be in any way desirable that the test should be applied unless some grounds of suspicion exist. Again, there should be a definite understanding as to the disposal of the animals which do react to the test. The possible results of the injection of tuberculin into the system of healthy cattle which do not react can only be a subject of speculation, but, according to the observation of Professor Virchow in Berlin during the rage for injecting tuberculin for the cure of consumption, one result was the driving of the tubercle organisms away from their habitat to seek new dwelling places in remote parts of the system; and in the early experiments which were made in this country on tuberculous guinea pigs, swelling and tenderness of the glands in various parts of the body, which, prior to the injection of tuberculin, were free from apparent disease, were invariably observed. If tuberculin is used as a means of detecting disease, all the animals which react to the test should certainly be prepared for slaughter, and be properly examined after slaughter before the meat is allowed to be used for human food.

In connection with the above remarks, it will be interesting to refer to a case which is recorded in *The Veterinarian* for August, and has already caused some comments in the agricultural press. Shortly put, the case as follows: Tuberculosis was known to have existed for years in a large dairy stock in Cheshire, and it was advised that the herd should be tested with tuberculin. Of 95 cows 71 reacted—*i.e.*, a distinct rise of temperature occurred in them in from ten to nineteen hours after inoculation, and they were accordingly condemned as tuberculous. The rest of the story may be best told in the words of the writer of the article:

"After the results were known, the owners inoculated the healthy animals in a building previously disinfected, and placed all the diseased ones together. Since then, I believe, most of the "suspects" have been disposed of in the public markets; fresh cattle have been bought and tested, the healthy ones kept, and the diseased ones sold. This method of eradicating tuberculosis affords food for reflection; it is perfectly legal, and with the morality of it the veterinary surgeon has nothing to do."

Avoiding the ethical question, we venture to doubt the legality of the procedure. An action for damages might show that the transaction was decidedly illegal.—*The Field.*

IMMUNITY AGAINST SNAKE POISON.

The following important article on the production of immunity against snake poison was communicated to the Royal Society of Edinburgh, June 3rd, 1895, by Prof. T. D. Fraser.

Varieties of Venom Used.

In this the first portion of the investigation the venoms that have been used are only four in number—those, namely, of the cobra of India (*Naja tripudians*), of the *Crotalus horridus* of America, of a large colubrine snake, probably a species of *Diemenia*, from South Australia, and of the *Sepedon hæmachates* of Africa. The venoms are therefore those of the most deadly of the poisonous serpents of Asia, America, Australia and Africa respectively; and, further, they are representative of the chief differences that occur in the composition and action of venoms, for they are derived from members of the two great groups of the colubrine and viperine serpents.

An essential preliminary to exact investigations with active substances must always be the determination of the activity of the substances. The only convenient method for doing this is to define the smallest dose capable of producing death for any given weight of animal—that is, the minimum lethal dose. The venoms in their natural state are inconstant in activity, mainly because of variations in the quantity of the water which they contain. The cobra venom has, however, nearly always been received in the form of a dry solid, but when this was not so it has been dried *in vacuo* over sulphuric acid.

Outside of India there are few persons skilled in the hazardous task of taking venom directly from living serpents. Accordingly, with few exceptions, the other venoms were not received in a pure form but in the form of the dried venom glands. From these glands, however, the poisonous constituents may easily be extracted with water, and on evaporating the solution over sulphuric acid an active dry venom was obtained, containing, however, other substances besides those which are active. I am not in a position, therefore, to make any statement in regard to the relative activity of the different venoms. For the object in view what only is necessary is that the exact minimum lethal dose of each venom used should be known, whether it be pure or diluted with a certain small amount of inert matter. Each of the four venoms was, however, found to be very active, but the cobra venom especially so.

Lethal Doses.

Experiments were made with it on several animals—as the guinea-pig, rabbit, white rat, cat, and the innocuous grass snake of Italy (*Tropedonotus natrix*). Very considerable differences were found to occur in the minimum lethal dose for each of these animals. For the guinea pig the minimum lethal dose per kilogram was 0.00018 g.; for the rabbit, 0.000245 g.; for the white rat, 0.00025 g.; for the cat somewhat less than 0.005 g.; for the kitten (6 weeks old), 0.002 g.; and for the grass snake the relatively larger dose of 0.03 g. Cobra venom thus takes a position among the most active of known substances, rivalling in its lethal power the most potent of the vegetable active principles, such as aconitine, strophanthin, or acokantherin.

These facts having been ascertained, attempts were next made to render animals proof against lethal doses by administering to them a succession of gradually increasing non-lethal doses. These were, for the first few doses, in some of the experiments, one-tenth of the minimum lethal; in others one-fifth, in others one-half of the minimum lethal; and in others almost as great as the minimum lethal. At varying intervals the doses were repeated, and by and by gradually increased, until

the actual minimum lethal dose had been obtained. The subsequent doses, by gradual increments, exceeded the minimum lethal, and after five or six times the minimum lethal had been reached, it was found that the increments could be increased, so that each became twice, four times, and latterly even five times the minimum lethal, and still the animal suffered little and, in many cases, no appreciable injury.

Many failures occurred before experience indicated the precautions and conditions that are necessary for success. Serpents' venom exerts what may broadly be described as a duplex action. It produces unseen functional disturbances, and it also produces visible changes. The latter are of a highly irritative character, causing intense congestion in the lungs, kidneys, and other organs, and, when given by subcutaneous injection, on all the structures of the skin and subjacent parts. There are apparently also some definite changes produced in the blood, with regard to which several important facts had been discovered by Dr. Martin, of the University of Sydney. Irritative effects are obviously produced by cobra venom, even in non-lethal doses, and with greatly increased virulence by doses that exceed the minimum lethal; but, in respect to this action, the other three venoms used are greatly more active than the venom of the cobra Evidence was obtained to indicate that in the process of immunisation a diminution occurs in the intensity of these local actions; but this diminution does not proceed so rapidly as that in the unseen functional or other changes which are the more direct causes of death; and, further, the local irritative changes, after having been produced, are slower to disappear than the unseen functional disturbance. Until these facts had been appreciated, and, indeed, even with the adoption of precautions suggested by them, frequent failures occurred. The apparently contradictory results accordingly were obtained of the production, by gradually increasing doses, on the one hand, of a protection against quantities much above the minimum lethal, so perfect that no apparent injury was caused; and, on the other hand, of an intolerence so decided that death was produced by the last of a succession of gradually increasing doses, no one of which was so great as the minimum lethal. The latter unfortunate event was frequently displayed in guinea-pigs, and attempts to carry immunisation in them to a high point were found to be extremely difficult.

Artificial Immunity.

Notwithstanding these difficulties, however, such gratifying results have been obtained as that rabbits could at last receive by subcutaneous injection so much as ten, twenty, thirty, and even the remarkable quantity of fifty times the minimum lethal dose without manifesting any obvious symptoms of poisoning.

Almost the only observable phenomena were a rise in the body temperature which continued for a few hours after the injection, and which contrasts with the fall that occurs after the administration of even non-lethal doses in non-protected animals, and a loss of appetite which usually, though not invariably, occurred, and was probably the cause of a temporary fall in weight during the day or two days succeeding each injection. On the other hand, during the process of successful immunisation the animals increased in weight, they fed well, and appeared to acquire increased vigour and liveliness. This has been frequently exemplified in the smaller animals, such as rabbits; and also, very conspicuously, in an aged and previously sedate horse, which in the process of immunisation has now received ten times the estimated minimum lethal dose.

In is marvellous to observe these evidences of the absence of injurious effects, and even of the production of benefit in an animal which, for instance, has received in one single dose a quantity of venom sufficient to kill, in less than two hours, fifty animals of the same weight, and in the course of five or six months a total quantity of venom sufficient to destroy the lives of 370 animals of the same species and weight.

With the cobra venom I have also immunised cats, both by subcutaneous and by stomach administration; but the significance of the latter method of administration must be reserved for a future communication. As I have stated, a horse is also being immunised; and I have to express my obligations to Principal Williams for granting me the accomodation of his establishment, and to Professor Davis, also of the New Veterinary College, for much valuable assistance.

Following the same plan of research with the three other venoms, it was found that the minimum lethal dose per kilogramme for rabbits of the diamantina venom is 0.0015 g.; of the venom of *Sepedon hæmachates* 0.00025 g.; and of the venom of crotalus 0.004 g. The crotalus venom is, in its purity, altogether comparable with the cobra venom; and the determinations therefore, show that cobra venom is sixteen times more powerful than crotalus or rattlesnake venom. This venom, as well as the two others, however, much exceed cobra venom in the intensity of their local action. When death is produced by crotalus venom, the subcutaneous tissues became extensively infiltrated with a large quantity of blood and of blood-stained serum, the underlying muscles are reduced to an almost pulpy blood-stained substance, and post-mortem decomposition occurs very soon after death. Similar changes in the subcutaneous tissues, but to a rather less degree, are caused by the diamantina venom, and in addition hæmaturia, or more probably hæmoglobinuria, was invariably produced by lethal and even by large non-lethal doses. I mention these circumstances to indicate the perfection of the protection which is produced by the administration of successive gradually increasing doses; for they can be so adjusted that a dose of each venom, even three times larger than the minimum lethal, may be administered without producing more than an inconsiderable and even scarcely observable degree of local destructive effect.

In the meantime, the process of protection with these latter venoms has not advanced further than three times the minimum lethal dose. This, however, has been sufficient to allow experiments to be made by which it has been demonstrated that when an animal has acquired a resistant power over the minimum lethal dose of one venom, that animal is also able successfully to resist the lethal action of a dose above the minimum lethal of other venoms. To a rabbit immunised by cobra venom, a dose above the minimum lethal of sepedon venom has been administered; to rabbits immunised with crotalus venom, doses above the minimum lethal of diamantina and of cobra venoms have been given; to animals immunised above the minimum lethal with the diamantina venom, doses above the minimum lethal of crotalus and sepedon venom have been given; and in each case the animal has recovered, and but few symptoms of injury produced. At the same time, in other experiments, indications were obtained that animals immunised with a given venom are capable of resisting the toxic effect of that venom more effectually than the toxic effects of other venoms.

Duration of Immunity.

My experiments have not yet proceeded sufficiently far to show for what length of time the protection conferred by any final lethal dose may last. I propose to make some experiments which will give definite information in regard to this point, which may possibly lead to practical applications. It has incidently been discovered, however, that protection lasts for at least a considerable period of time, even when the last protective dose has

not been a large one. For example, to a rabbit which had last received twice the minimum lethal dose of crotalus venom, the same dose was administered twenty days subsequently, and it altogether failed to produce any toxic symptoms.

As yet no sufficient data have been obtained for affording an explanation of these remarkable facts. It is obvious that the blood of protected animals must contain some substance or substances which are not present in the non-protected animals, by which the lethal and toxic effects of venoms are prevented. When the blood serum of protected animals is added to a solution of venom a distinctly observable reaction occurs, and this reaction may be of significance when considered along with circumstances which will be stated in the remaining part of this communication, and especially with the circumstance that the blood serum is itself almost destitute of physiological activity. This protective substance may be produced in the body by the influence of the venom, but it is also conceivable that the substance is actually a part of the venom itself, which gradually accumulates under repeated administrations, whereas the lethal and toxic constituents of the venom are more rapidly destroyed or eliminated.

The Blood Serum of Immunised Animals: Antivenene.

Having thus succeeded in producing a high degree of protection in animals against the toxic effects of serpents' venom, the blood serum of these animals was, in the next place, collected for the purpose of testing its antidotal properties. A few preliminary experiments were, however, early made with the serum of animals in whom the protection had not been carried to a high degree, and they were sufficient to show that antidotal properties are possessed even by this serum. It soon became apparent that, in order to obtain some reasonable approximation to constancy in the conditions of the experiments, it was necessary that the serum should be in such a state that it would remain unchanged during at least several weeks. It was found that this could be insured without any appreciable loss of antidotal power by drying the freshly separated serum in the receiver of an air pump over sulphuric acid, after it had been passed through a Chamberland's filter. A perfectly dry and easily pulverisable solid was thus obtained, which could be kept unchanged for probably an indefinite time, and from which a normal serum could easily be prepared as required by merely dissolving a definite quantity of the dry serum in a definite quantity of water. To this serum, whether in the dry form or in solution, it would be convenient to apply the name *antivenene*.

The greater number of the experiments now to be described were made with antivenene derived from the mixed serum of three rabbits, which had last received a dose of cobra venom equivalent to thirty times the minimum lethal. I avoid the expression "immunised against" thirty times the minimum lethal dose, for, as a matter of fact, an animal is always protected or immunised against a dose considerably above the last which it had received.

The experiments were so planned as to obtain in three or four different conditions as exact a definition as possible of the antidotal power of the antivenene. Four series of experiments have been undertaken on rabbits; but all the experiments required to complete two of these series have not yet been made. In one series the venom was mixed outside of the body with the antivenene, and immediately thereafter the mixture was injected under the skin of the animal; in the second series the venom and antivenene were almost simultaneously injected into opposite sides of the body; in the third series the antivenene was injected some considerable time before the venom; and in the fourth series the venom was first injected, and thirty minutes afterwards the antivenene.

All or nearly all, the experiments required to define the exact quantity of antivenene that is sufficient to prevent death from different lethal doses of venom have been as yet made only in the first and fourth of these series. They are, however, in some respects the most important of the series, as the conditions for exactitude in simultaneous administration are perfectly obtained in the first series, and it therefore should constitute the basis for comparison between antivenene derived from different sources; and as upon the results of the fourth series must depend the actual practical application of antivenene in the treatment of poisoning by serpents' bites.

In the experiments of the first series the doses of cobra venom administered were the minimum lethal, twice the minimum lethal, and thrice the minimum lethal. In the case of each dose experiments were made with different quantities of antivenene so as to determine the quantity required to prevent death. In order to render it certain that a lethal dose was always administered in the experiments with the so-called minimum lethal, the minimum lethal indicated by the previous experiments was not used, but instead a slightly larger dose (0.00026 instead of 0.000245 g. per kilogramme).

When this certainly lethal dose, capable of causing death in five or six hours, was mixed with antivenene and the mixture then injected under the skin, it was found that so small quantities of antivenene were sufficient to prevent death as 0.5 c.cm., 0.25, 0.1, 0.05, 0.02, 0.01, 0.005, 0.004 c.cm. ($\frac{1}{2}$, $\frac{1}{4}$, 1-10th, 1-20th, 1 50th, 1-100th, 1-200th, 1-250th, of a c.cm.) for each kilogramme of the weight of the animal. With 0.0025 c.cm. (1-400th), however, the animal died. The antivenene was therefore found to be so powerful as an antidote in the condition of these experiments, that even the 1-250th part of a cubic centimetre, equivalent to about 1 15th part of a minim, acted as an efficient antidote. Even with the smaller of these doses of antivenene there was almost no symptom of poisoning produced. In the experiments of this series with twice the minimum lethal dose recovery occurred when the doses antivene were 0.75, 0.7, and 0.6 c.cm. per kilogramme, but 0.5 c.cm. per kilogramme failed to prevent death. In the experiments with thrice the minimum lethal dose of venom (a dose capable of producing death in less than two hours) recovery occurred when the doses of antivenene were 1.5 c.cm. and 1. c.cm., but death occurred with 0.8 c.cm., and even the enormous dose of four times the minimum lethal failed to produce death, or, indeed, any observable disturbance, when it had previously been mixed with 2 c.cm. per kilogramme of antivenene.

In the *second* series experiments have been made only with twice the minimum lethal dose of venom. When this dose was injected into the subcutaneous tissue of one side of the body, and immediately thereafter a dose of antivenene, it was found that doses of 1 c.cm., 2 c.cm., and 3 c.cm. per kilogramme failed to prevent death, but that 2.5 c.cm and 3 c.cm. per kilogramme were able to do so.

In the *third* series the experiments have as yet been made with only the minimum lethal of cobra venom, and they show that 4 c.cm. per kilogramme of this antivenene is able to prevent death when given thirty minutes before the venom.

In the *fourth* series, where the results are likely to give the clearest indications of the antidotal value of antivenene, it was found that recovery occurred in the experiments in which 1.5 c.cm., 1 c.cm. and 0.8 c.cm. per gramme of antivenene were injected *thirty minutes after a certain* minimum lethal dose of venom; but that the antivenene was insufficient in quantity to prevent death when 0.75 c.cm. per kilogramme or less was administered. In this series, further, it was found that 5 c.cm. per

kilogramme of antivenene was a sufficient dose to prevent death after twice the minimum lethal dose of venom, but that 2 c.cm., 2.5 c.cm., and 3 c.cm. per kilogramme were insufficient.

The experiments of this series are especially interesting, as nearly all the animals showed symptoms of poisoning before the antivenene had been administered. In each of the fatal experiments the duration of life was greatly prolonged by the administration of antivenene; and it is probable that in many instances a second injection of antivenene, made half an hour or an hour after the first, would have prevented death.

It has thus been established, on the clearest evidence, that the blood serum (antivenene) of animals protected against large lethal doses of venom is able, in varying conditions of administration, perfectly to prevent lethal doses of the venom of the most poisonous of serpents from producing death in non protected animals.

In order to obtain some evidence bearing on the question as to whether the more powerful antivenene is produced by the long continued administration of small non-lethal doses of venom, or by the administration of doses gradually increasing until a large lethal dose is reached, a few experiments were made with the serum of a rabbit which had received 1-10th of the minimum lethal dose nearly every two days during a period of three months and one week, and also of one which had received the 1-4th part of the minimum lethal dose nearly every four days during a period of three months and three weeks. I did not find that the antidotal power of the antivenenes obtained from these animals was great, or nearly so effective as the antivenenes obtained from animals which had finally received a dose much in excess of the minimum lethal. When mixed with venom and then injected, 3 c.cm. per kilogramme of these antivenenes was insufficient to prevent death from somewhat more than the minimum lethal dose of venom, but 5 c.cm. per kilogramme were sufficient to do so.

I have also administered 1.5 c.cm. per kilogramme of cobra antivenene thirty minutes after a dose one-twelfth larger than the minimum lethal dose of the venoms, respectively, of the *Sepedon hæmachates*, the *Crotalus horridus*, and the *Diementina* serpent, and the rabbits experimented on have recovered. This successful result is all the more remarkable when the intensely destructive local effects of each, but especially of two of these venoms is recollected.

The experiments establishing, and to some extent defining, the antidotal power of cobra venom, further, have been made on animals peculiarly susceptible to the poisonous action of serpents' venom, a circumstance of importance in considering the probable value of the antivenene when used as an antidote in the treatment of animals of less susceptibility, among whom there appears to be sufficient evidence to place human beings. The minimum lethal dose for man probably approximates that of the cat, rather than that of vegetable feeders, such as the rabbit, guinea-pig, and white rat.

It is also to be remembered that, so far, the experiments have been restricted to a definition of the antidotal power in certain conditions which were not always the most favourable for the mere prevention of death. Indications have indeed been obtained which render it highly probable that death may be prevented from occurring more certainly by several administrations rather than by one administration of antivenene, and also by the introduction of the antivenene into the same parts as the venom rather than into distant parts.

It would be important also to increase the number of the experiments with the larger of the lethal doses of venom as yet administered, and it may be to employ still larger doses; although for practical application, the larger of the doses that have already been used, as they produce death in about an hour, need not be increased. To these purposes I hope to apply the antivenene soon to be prepared from the rabbits which have already received fifty times the minimum lethal dose of venom.

Antivenene in the Treatment of Snake Bite in Man.

For the actual application of the antivenene to the treatment of snake poisoning in man, an endeavour is being made to obtain the large quantity that is requisite from a horse now receiving considerable lethal doses of cobra venom. From this source, also, it is hoped that a sufficient quantity will be obtained to allow of the examination of the chemical properties of the antivenene to be continued, with the object of discovering the constituent or constituents by which the antidotal effects are produced. If the isolation of the antidotal constituent or constituents can be effected, an antivenene of greatly increased power will be obtained and the range of efficient application will be increased. For these objects, however, it will be necessary to administer to the horse much larger doses than it has yet received; and the chief difficulty in doing this is to obtain a sufficient supply of cobra venom. By the great kindness of Surgeon-Colonel Cunningham 9 g. of dry venom have already been obtained, but in order to carry the protection to fifty times the minimum lethal dose other 30 g. would be required. I have reason to hope that the India Office will succeed in making arrangements for procuring even this large quantity.

The subject is one of practical importance to India, where the destruction of human life by venomous serpents is represented by an animal mortality of 20,000, and where the failure of all methods of treatment has led to the introduction of a system of extermination of venomous serpents—apparently futile in its results—in the carrying out of which large sums of money have been expended.

In considering the probabilities of success by antivenene treatment it is also to be recollected that antivenene can be obtained even more powerful than that which was used in the experiments which have been described, and that judging from the statistics of Fayrer and Wall, in 75 per cent. of fatal cases in man death does not occur until from three to twenty-four hours after the infliction of the bite. This latter fact appears to indicate that in the great majority of the fatal cases the dose of venom does not much exceed the actual minimum lethal, and therefore, is not so large as the doses whose lethal action has been prevented from occurring in the experiments that have been described, in which, further, the conditions of success in preventing death were not the most favourable that could have been adopted.

It appears to me, however, that an interest and importance as great as that which can be derived from this practical application of the facts is to be found in their relation to the cause and treatment of many of the most fatal diseases—those, namely, which are produced by organisms that have found their way into the body. The evidence in favour of the curative value of the antitoxins derived from animals immunised against the toxins of these diseases seems to receive an additional confirmation from these facts. They also bring distinctly before us the circumstance that there are limits to this curative power dependent on the dose of the toxin to be counteracted, on the special antidotal activity of the antitoxin that is used, and on the duration of the time during which the toxin has had an opportunity of exerting its poisonous action before the antitoxin is administered. If these and other conditions interfering with successful treatment are not determined and recognised, unmerited discredit is likely to be attached to remedies which alone of all remedies may be capable of preventing death in these diseases, by counteracting the effects of minimum lethal and larger doses of the toxin.

The Veterinary Colleges.

The sessional course of instruction for 1895-96 will commence on Wednesday, October 2nd next, when Lord Houghton will preside, and the introductory address be delivered by Professor Penberthy. The matriculation examination will be held at the College, Camden Town, N.W., on September 3, 4 and 5. Candidates are required to forward their names, together with the examination fee of 25s., not later than the 24th inst., to the Secretary of the College, Mr. Richard A. N. Powys.

The Prospectus of the New Veterinary College, Edinburgh, Prof. Williams, Principal, has been issued for Session 1895 96. The Veterinary Profession is making rapid strides in public estimation and offers a promising field for young men having a taste for active out-door life. The College qualifies for all appointments in the Profession, including those of the Army Veterinary Department.

Dr. A. Chauveau.

On the occasion of the fête nationale of the 14th of July, Dr. A. Chauveau, Member of the Institute, General Inspector of the Veterinary Schools of France, received the decoration of *Commandeur* of the *Legion d'Honneur*.

ARMY VETERINARY DEPARTMENT.

Extract from *London Gazette*.

India Office, Aug 16th, 1895.

The Queen has approved of the retirement from the Service of the undermentioned officer:—

Bengal Veterinary Establishment:—Vet.-Lieut.-Col. George Kettlewell (Feb. 19).

Retired List:—Staff Veterinary Surgeon R. J. G. Hurford, R.L., has been granted a Good Service pension of £50 per annum, vacated by late Principal Veterinary Surgeon J. Collins, R.L., deceased.

Vet.-Captain T. A. Killick returned to Woolwich on the 10th instant, and Vet.-Lieut. F. M. Case, to Aldershot, 16th instant on completion of duty with Mobilized Reserve Force.

Vet.-Captain A. J. Haslam returned to Dublin on termination of the manœuvres, Eastern Force, Ireland, on the 17th instant.

Vet.-Captain R.W. Raymond accompanied the 8th Hussars from Hounslow on the 14th instant, and Vet.-Captain T. Marriott with 7th Dragoon Guards from Shorncliffe, on the 3rd instant, for duty, with the Aldershot Cavalry Manœuvres.

The death of Principal Veterinary Surgoen James Collins leaves vacant a distinguished service reward, one of two granted to the department. Mr. Collins was in veterinary charge of the Inniskilling Dragoons throughout the Crimean War, having succeeded to the appointment at the death of Mr. Kelly, who was drowned when the transport *Eupatoria* was burnt *en route* to the Crimea. There now only remain three veterinary officers who were at the Alma and Balaclava, in addition to the siege of Sebastopol, viz., Veterinary Surgeon Stephen Price Constant, who was with the 17th Lancers and 5th Dragoon Guards; Veterinary Surgeon Felix Delany, on the general staff throughtout the campaign, and Vety.-Surgeon T. P. Gudgin, who was with the Scots Greys and 5th Dragoons Guards. Staff Veterinary Surgeons A. J. Owles, John Barker, R. W. Murray and Herbert Sewell wore present at the siege of Sebastopol.—*Broad Arrow.*

REVIEW.

SCIENTIFIC (?) HORSE SHOEING.

This is a handsome book of over 250 pages, illustrated with 144 drawings—some of them coloured. The title page runs "Scientific Horse-shoeing, for leveling and balancing the action and gait of horses and remedying and curing the different diseases of the foot. By Professor William Russell, Practical Horse-shoer." The publishers are The Robert Clarke Company, of Cincinnati, U.S.A., who have done their share of the work right well indeed.

The book is disappointing. The preface states "The aim of this work is one and simple. It is to present in the shortest possible space and in the plainest possible manner what every man should know of the practice and art of Horse-shoeing." We read it carefully and fail to find either simplicity or lucidity. On the contrary, we find mystification and dogmatic assertion of error.

The first two chapters are on the Horse in general and the "Bones of the Horse." Chapter 3 treats of the foot and locomotory apparatus. The chapter on Practical Horse-shoeing occupies about 30 pages, and here we expected to find some practical sound information, There is some, but it is spoiled by the prominence given to an invention, "Russell's Foot Adjuster," which is called a scientific tool and recommended "to secure that precision and perfection imperatively demanded." This instrument consists of a horse-shoe shaped plate upon the toe of which is fixed an upright indicator and graduated quadrant with a moveable lever to show the angle of obliquity of the wall. This of course is to guide the farrier in reducing to proper proportions the height of toe and heel. If the feet of horses were all the same shape and the obliquity of the wall a definite quantity the instrument would be useful. As the form of feet differs and the obliquity of the wall is indefinite, the "adjuster" is more likely to mislead than assist, and it favours the dangerous practice of attempting to reduce feet to an ideal standard instead of to the best form attainable with each foot. Mr. Russell advises even worse practice than this, for on page 97 is a drawing of "a perfect front foot properly prepared." Now this foot is a geometrical figure. A line drawn through the centre of the frog divides the foot into two exactly symmetrical halves, and the letter-press insists that all measurements from this line to any part of the foot should on each side be equal. A more mechanical and false process of teaching we cannot imagine.

On shoeing young horses our author makes some pertinent and useful observations, but he again detracts from the value of his work by adding to his practical observation some pages on "Determining the Gait" and "Balancing the action." Horse-

owners in the States seem to be easily satisfied by plausible nonsense of this kind, and trainers out there seem to accept as gospel any mystification that includes a queer shaped shoe and some weights and pulleys. Verily the "medicine man" has survived the downfall of the Indian, and the horse-owner of America must have retained a large measure of the credulity which we fancied had departed with the Red-man.

The Chapter on "Pathological Shoeing" is a little worse than that on ordinary shoeing, and the treatment of the deformity resulting from laminitis is heroic—but it is not surgery.

If it be true, as the publisher's circular sent with the book says, that Professor (?) Russell "has long been recognised by the leading horsemen of this country as the foremost shoeing-smith of the age," we can only express our regret that the author has done himself such injustice as to write a book. It ought to have been entitled "Theoretical Horse-shoeing," and then all we need have said would have been that the theory was erroneous.

CORRESPONDENCE.

ANÆSTHETICS AND THE STANDING OPERATION.

SIR,

For the past two seasons we have operated on all ages, classes, and conditions of horses, in the standing position—using the Huish-Blake instrument—and with perfectly satisfactory results. We do not find it necessary to have recourse to the "irritants" to which Mr. Wallis Hoare takes exception—caustic clam or anything else.

I should like to congratulate those practitioners whose lines have fallen in such pleasant places that they can afford to defy competition, and whose remuneration is so liberal that they can practice anæstheticism with such an unstinted hand.

It is not my intention to enter into a correspondence on this subject, but I wish to support Mr. Parker's remarks regarding the standing operation and its advantages.—Yours truly,

R. ST. C. HOUSTON.
(Assistant to Mr. W. B. Nelder, F.R.C.V.S.)
Exeter, August 19th.

SIR,

Those who advocate the standing operation say that it is more humane, that the pain is momentary, that the risk is less, and that it is less expensive. I don't think it can be more humane, for I am certain every man before he had so painful an operation performed on himself would prefer to be put under chloroform. Why some of your correspondents should think that horses feel less than men I fail to understand.

As to its being "momentary;" is the operation to be measured by seconds or minutes? As to the safety: We have even in this correspondence in your paper, and from the pen of the operator, "C.P.," who adopts this method, instances in which great pain and risk are involved; as to the expense, I can only go by my own experience, that the services of a most skilful castrator, *plus* those of a veterinary surgeon, *plus* the cost of the chloroform, do not amount to two guineas—An operator's "invariable fee" for the standing operation.

I see, too, that people argue that the fear which a colt feels when cast more than counter-balances the pain minimised by the chloroform. I believe, from what I have seen myself, that if a colt is properly cast, he is down, secured, and has the chloroform muzzle on so quickly that he has very little time to be frightened in. When I say *properly cast*, I don't mean that the colt's legs should be pulled together, and that he should tumble over anyway, but I mean that his hind legs should be pulled forward so that he sits down on his haunches and rolls over. I don't think there is much risk in casting in this fashion. I want my colts castrated in the safest way, and with the least infliction of pain, so long as the operation is none the less safe, and therefore I always give chloroform, use a chloroform muzzle and have the colt cast.

"C.P's" letter of August 10th, with its graphic description of the standing operation, does not lead one to think it either safe or humane, and though possibly in the case of heavy cart horses and aged thoroughbred horses, it may sometimes be advisable to avoid casting, yet my own experience (which the letters of Mr. Parr, Mr. Wallis Hoare, Mr. Freer and others confirm) will tell me to use the chloroform muzzle whenever I have a colt castrated.—Yours,

F. A. WOBRYCHE-WHITMORE.
Kingslee, Farndon, Chester, Aug. 18th.

SIR,

I have few words to say, and will not occupy much of your valuable space. In my last letter I advocated that "one method *i.e.* casting and chloroforming, is of necessity prolonged and consequently painful; the other if properly done is momentary, and therefore more humane." Not one word of this has been refuted, although much shuffling and prevaricating has been indulged in.

Mr. Hoare throws other men's brains at me in the shape of quotations. Let me to him commend another:

"Let such teach others who themselves excel."

Again, the same author:—

"Words are like leaves; and where they most abound
Much fruit of sense beneath is rarely found."

I have read and re-read Mr. Freer's letter, can only come to one conclusion; *i.e.* that it was written in a hurry. He mixes up the Scriptures, a countess, a departure for Newmarket, with a broken back, and grimly hints the while at the destruction of the standing operator. By some unknown reasoning he connects an accident to a colt whilst galloping in a field—possibly months afterwards—with an unknown deity who he calls "melancholy;" and speaks of the future world in a manner that if it were not comical, would appear profane.

Mr. Freer states that the alleged increase of schirrous is due to the fact that standing operators are not sufficiently careful to return the cord. Will he remember that my letter was not written to defend careless operators? He very candidly tells us of a broken back, and says no chloroform was used: but surely he does not intend us to believe that it would have been otherwise had the anæsthetic been administered. Or, that the spinal colum would not have remained intact, if this animal had been emasculated standing. That "there are as many shivering fillies as colts," is I should say, the negative experience of most of us. Also, that the latter present symptoms of shivering "months before castration," which means when they are foals or yearlings.

I am asked how the misstatements of your contributors can do harm? I will tell them: By abusing an operation of which they unblushingly avow their ignorance—which is calculated to minimise the sufferings of those dumb animals which it is our duty, as men and as veterinarians, to alleviate.—Your obedient servant,

Aug. 20th, 1895. AN OPERATOR.

COMMUNICATIONS, BOOKS AND PAPERS RECEIVED—Messrs. J. C. James. St. C. Houston, W. F. Whitemore, G. K. W., E. Faulkner, "An Operator." "Tuberculosis in Cattle."